



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/881,769 | 06/18/2001 | Izuru Nakai | P21131 | 8245 |

7055 7590 04/22/2003

GREENBLUM & BERNSTEIN, P.L.C.
1950 ROLAND CLARKE PLACE
RESTON, VA 20191

EXAMINER

STAICOVICI, STEFAN

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

1732

8

DATE MAILED: 04/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-8

Office Action Summary

Application No.

09/881,769

Applicant(s)

NAKAI ET AL.

Examiner

Stefan Staicovici

Art Unit

1732

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

P r i d for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 February 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disp sition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) 4 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Pri rity under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

Response to Amendment

1. Applicants' amendment filed February 4, 2003 (Paper No. 7) has been entered. Claims 1-3 have been amended. No claims have been canceled. New claims 5-11 have been added. Claims 1-11 are pending in the instant application.

Election/Restrictions

2. Applicant's election with traverse of Group I in Paper No. 7 is acknowledged. The traversal is "the same for at least the same reasons set forth in the Response to Election Requirement filed by Applicants on October 23, 2002" (see page 6 of the amendment filed February 4, 2003).

This is not found persuasive because, under MPEP § 806.05(e)), the inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. As stated in the Restriction Requirement mailed on November 4, 2002 (Paper No. 6), the process as claimed can be practiced by another materially different apparatus, such as laser apparatus that has a converging lens that is moved in a vertical direction to the target in order to modify the spot size and the focal point, rather than modifying the laser energy using a control device.

The requirement is still deemed proper and is therefore made FINAL.

3. This application contains claim 4 drawn to an invention nonelected with traverse in Paper No. 7. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-3 and 5-7 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claim 1, lines 7-8, the newly added limitation of “the first energy being within a range of approximately $1/7$ to $7/25$ of the second energy” (emphasis added) does not appear to have support in the original disclosure because, the recited energy range is a specific example limited to laser drilling holes having a specific diameter of 150-200 microns in a sheet-like material having a specific thickness of 130-150 microns and does not appear to have support for the broader limitation of simply “laser drilling a hole in a multi-layered sheet-like material”.

In claim 5, lines 7-8, the newly added limitation of “the first energy being within a range of approximately $1/35$ to $2/25$ of the second energy” (emphasis added) does not appear to have support in the original disclosure because, the recited energy range is a specific example limited

to laser drilling holes having a specific diameter of 150-200 microns in a sheet-like material having a specific thickness of 130-150 microns and does not appear to have support for the broader limitation of simply "laser drilling a hole in a multi-layered sheet-like material".

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 9, lines 3-4, the limitation of "the inter-layer pull-off force of the second energy being vented through the initial hole" is unclear as to whether "energy" is being "vented" or a "gas" is being "vented". It should be noted that for the purpose of examination it has been assumed that a "gas" is being "vented."

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-3 and 5-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ayrton (US Patent No. 5,741,456) in view of WO 86/02301 and in further view of Temple *et al.* (US Patent No. 6,228,311 B1).

Ayrton ('456) teaches the basic claimed process of drilling a hole in a multi-layered sheet using a laser without delamination of said multi-layered sheet occurring (see col. 2, line 53 through col. 3, line 18). It is submitted that since delamination is avoided, that the resulting inter-layer pull-off force is smaller than an inter-layer adhesion force.

Regarding claims 1, 5 and 8, Ayrton ('456) does not teach a first train of low-powered laser pulses to drill said hole in said multi-layered sheet and a second train of higher power pulses to trim said drilled hole. It is submitted that a train of laser pulses includes a plurality of individual pulses. WO 86/02301 teaches the claimed process of laser drilling a multi-layer sheet by providing a train of low-powered laser pulses to drill through said multi-layered sheet, said low powered pulses preventing delamination, and after said multi-layered sheet has been drilled, higher power pulses are employed. It is submitted that since delamination is avoided, that the resulting inter-layer pull-off force is smaller than an inter-layer adhesion force (see Abstract and page 6, line 4 through page 7, line 14). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a first train of low-powered laser pulses to drill a hole in a multilayered-sheet as taught by WO 86/02301 in the process of Ayrton ('456), because WO 86/02301 specifically teaches that low-powered laser pulses avoid delamination of said multi-layered sheet, whereas Ayrton ('456) teaches laser drilling in a multi-layered sheet while

avoiding delamination of said multi-layered sheet, hence both references solving the similar problem of delamination of a multi-layered sheet while drilling holes therein.

Further regarding claims 1 and 5, although WO 86/02301 specifically teaches using low-powered laser pulses followed by high powered laser pulses in order avoid delamination when laser drilling a multi-layered sheet, Ayrton ('456) in view of WO 86/02301 does not specifically teach that the first energy is within a range of approximately "1/7 to 7/25" or "1/35 to 2/25" of the second energy. However, WO 86/02301 specifically teaches altering the pulse width and peak energy (see Abstract and page 6, lines 20-25) in order to control the size of the resulting hole. As such, it is submitted that the energy of the laser energy is a result-effective variable. In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). Therefore, it would have been obvious for one of ordinary skill in the art to have used routine experimentation to determine an optimum laser energy range in the process of Ayrton ('456) in view of WO 86/02301 because, WO 86/02301 specifically teaches altering the pulse width and peak energy in order to control the size of the resulting hole, hence teaching that the laser energy is a result-effective variable.

Further regarding claims 1, 5 and 8, although WO 86/02301 teaches a second train of higher power pulses, the process of Ayrton ('456) in view of WO 86/02301 does not teach trimming said drilled hole in a multi-layered sheet. Temple *et al.* ('311) teach laser drilling a hole in which the laser power is increased at the end of the drilling process in order to trim the final shape of said drilled hole (see col. 7, lines 1-11). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a second train of higher power pulses as taught by WO 86/02301 to trim said drilled hole as taught by Temple *et al.* ('311) in the process of Ayrton

(‘456) because, Temple *et al.* (‘311) specifically teach that increasing the power of said laser results in an improved internal finish of said drilled hole, hence an improved product is obtained. Furthermore, it should be noted that Temple *et al.* (‘311) specifically teach maintaining the laser power low at the beginning of the drilling process in order to avoid damage due to exhaust products, hence teaching a similar two-step laser drilling process as WO 86/02301.

Regarding claims 2-3, 6-7 and 10-11, WO 86/02301 teaches altering the pulse width and peak energy (see Abstract and page 6, lines 20-25). Therefore, it would have been obvious for one of ordinary skill in the art to have altered the pulse width and peak energy for a second train of higher power pulses as compared to a first train of laser pulses taught by WO 86/02301 to drill and trim said hole as taught by Temple *et al.* (‘311) in the process of Ayrton (‘456) because, WO 86/02301 specifically teaches that low-powered laser pulses avoid delamination of said multi-layered sheet, whereas Temple *et al.* (‘311) specifically teach that altering the power of said laser results in an improved internal finish of said drilled hole, hence an improved product is obtained.

In regard to claim 9, Temple *et al.* (‘311) specifically teach maintaining the laser power low at the beginning of the drilling process in order to avoid damage due to exhaust products (see col. 7, lines 1-11). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a second train of higher power pulses as taught by WO 86/02301 to trim said drilled hole as taught by Temple *et al.* (‘311) in the process of Ayrton (‘456) because, Temple *et al.* (‘311) specifically teach that increasing the power of said laser results in an improved internal finish of said drilled hole and avoids damage due to exhaust products created at the beginning of the laser drilling, hence an improved product is obtained.

10. Claims 1-3 and 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 86/02301 in view of Temple *et al.* (US Patent No. 6,228,311 B1).

WO 86/02301 teaches the basic claimed process of laser drilling a multi-layer sheet by providing a train of low-powered laser pulses to drill through said multi-layered sheet, said low powered pulses preventing delamination, and after said multi-layered sheet has been drilled, higher power pulses are employed. It is submitted that since delamination is avoided, that the resulting inter-layer pull-off force is smaller than an inter-layer adhesion force (see Abstract and page 6, line 4 through page 7, line 14). It is submitted that a train of laser pulses includes a plurality of individual laser pulses.

Regarding claims 1 and 5, although WO 86/02301 specifically teaches using low-powered laser pulses followed by high powered laser pulses in order avoid delamination when laser drilling a multi-layered sheet, WO 86/02301 does not specifically teach that the first energy is within a range of approximately "1/7 to 7/25" or "1/35 to 2/25" of the second energy. However, WO 86/02301 specifically teaches altering the pulse width and peak energy (see Abstract and page 6, lines 20-25) in order to control the size of the resulting hole. As such, it is submitted that the energy of the laser energy is a result-effective variable. In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). Therefore, it would have been obvious for one of ordinary skill in the art to have used routine experimentation to determine an optimum laser energy range in the process of WO 86/02301 because, WO 86/02301 specifically teaches altering the pulse width and peak energy in order to control the size of the resulting hole, hence teaching that the laser energy is a result-effective variable.

Regarding claims 1 and 5, although WO 86/02301 teaches a second train of high-powered pulses WO 86/02301 does not teach trimming said drilled hole using a second train of high-powered laser pulses. Temple *et al.* ('311) teach laser drilling a hole in which the laser power is increased at the end of the drilling process in order to trim the final shape of said drilled hole (see col. 7, lines 1-11). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a second train of high-power pulses to trim said drilled hole as taught by Temple *et al.* ('311) in the process of WO 86/02301 because, Temple *et al.* ('311) specifically teach that increasing the power of said laser results in an improved internal finish of said drilled hole, hence an improved product is obtained. Furthermore, it should be noted that Temple *et al.* ('311) specifically teach maintaining the laser power low at the beginning of the drilling process in order to avoid damage due to exhaust products, hence both references teaching a similar two-step laser drilling process.

In regard claims 2-3 and 6-7, WO 86/02301 teaches altering the pulse width and peak energy (see Abstract and page 6, lines 20-25).

Response to Arguments

11. Applicant's arguments filed February 4, 2003 (Paper No. 7) have been considered.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicants argue that although Ayrton ('456) "mentions avoiding delamination, the inventors apparently credit the nature of the material, as opposed to the laser energy, for avoiding delamination" (see page 7 of the amendment filed February 4, 2003). In response, it should be noted that under MPEP §2144, the "reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem."

Applicants argue that the "Examiner has improperly drawn a cause and effect conclusion with respect to AYRTON, apparently under an inherency argument, that the inventors themselves did not draw" (see page 7 of the amendment filed February 4, 2003). Further, MPEP §2144.01 states that when "considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom." In re Preda, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968). As such, although Ayrton ('456) does not specifically teach that the resulting inter-layer pull-off force is smaller than an inter-layer adhesion force, such a conclusion is valid because Ayrton ('456) specifically teaches that delamination is avoided. It should be noted that if the resulting inter-layer pull-off force is smaller than an inter-layer adhesion force then delamination would occur and the invention of Ayrton ('456) would not function as described. When the reference relied on expressly anticipates or makes obvious all of the elements of the claimed invention, the reference is presumed to be operable and the burden is on applicant to provide facts rebutting the presumption of operability. In re Sasse, 629 F.2d 675, 207 USPQ 107 (CCPA 1980).

Applicants argue that “there is no motivation to combine WO 86/02301 with AYRTON, insofar as each reference explicitly discloses delamination is prevented, so there is no need to improve either reference, at least for purposes of preventing delamination” (see page 8 of the amendment filed February 4, 2003). In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, although both Ayrton ('456) and WO 86/02301 discuss prevention of delamination using a laser process, Ayrton ('456) does not disclose any specifics regarding the laser process. Ayrton ('456) teaches a process of drilling a hole in a multi-layered sheet using a laser without delamination of said multi-layered sheet occurring (see col. 2, line 53 through col. 3, line 18). It is submitted that since delamination is avoided, that the resulting inter-layer pull-off force is

smaller than an inter-layer adhesion force. WO 86/02301 teaches a laser drilling process of a multi-layer sheet by providing a train of low-powered laser pulses to drill through said multi-layered sheet, said low powered pulses preventing delamination, and after said multi-layered sheet has been drilled, higher power pulses are employed. It is submitted that since delamination is avoided, that the resulting inter-layer pull-off force is smaller than an inter-layer adhesion force (see Abstract and page 6, line 4 through page 7, line 14). Therefore, it would have been obvious for one of ordinary skill in the art to have provided a first train of low-powered laser pulses to drill a hole in a multilayered-sheet as taught by WO 86/02301 in the process of Ayrton ('456), because WO 86/02301 specifically teaches that low-powered laser pulses avoid delamination of said multi-layered sheet, whereas Ayrton ('456) teaches laser drilling in a multi-layered sheet while avoiding delamination of said multi-layered sheet, hence both references solving the similar problem of delamination of a multi-layered sheet while drilling holes therein. Therefore, the teachings of WO 86/02301 were used to show that delamination of a multi-layered sheet when being laser drilled is avoided by providing a train of low-powered laser pulses to drill through said multi-layered sheet, and after said multi-layered sheet has been drilled, using higher powered pulses.

Applicants argue that the art of record does not teach or suggest "ranges of ratios between the first laser pulse energy and the second (higher) laser pulse energy" (see page 8 of the amendment filed February 4, 2003). However, this argument is drawn to a newly presented claim limitation not previously presented that has been rejected in this Office Action as set forth above.

Art Unit: 1732

12. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Conclusion

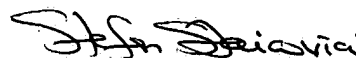
13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stefan Staicovici, Ph.D. whose telephone number is (703) 305-0396. The examiner can normally be reached on Monday-Friday 8:00 AM to 5:30 PM and alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard D. Crispino, can be reached at (703) 308-3853. The fax phone number for this Group is (703) 305-7718.

Art Unit: 1732

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.

Stefan Staicovici, PhD



Primary Examiner

4/20/03

AU 1732

April 20, 2003